corresponds to its one degree of freedom on Boltzmann's theory of partition of energy, I am afraid the amount of energy of this kind on each particle is hardly sufficient to account for any observable phenomenon. That it may, however, be much greater seems justified by the failure of this theory, so far as is known, in other cases, and this must be my excuse for calling attention to what seems certainly a *vera causa* for structures and actions in matter of a size comparable with the heat vibrations in the ether, even though the amount of this cause may, when fully investigated turn out to be so small as to be insufficient to produce observable effects.

GEO. FRAS. FITZGERALD.

REPORT OF THE MALARIA EXPEDITION TO SIERRA LEONE.

FOLLOWING close on the "Instructions for the Prevention of Malaria," the Liverpool School of Tropical Medicine have issued the report of the malaria expedition sent out to Sierra Leone by that body in August last. Their objects, as stated in the report, were :—

(1) To find one or more species of insects hospitable to the human Hæmamœbidæ on the West Coast of Africa.

(2) To study the bionomics of these insects, with a view to suggesting better modes of prevention of malarial fever than those hitherto known to us.

The terminology adopted is that used by Major Ross in consultation with Prof. Herdman, already noticed in NATURE (August 3, 1899). It is proposed to abolish the word mosquito, and use the old English equivalent, gnat, as there is no difference between the two, and because the terms malaria and malarial fever no longer hold—they propose the term hæmamœbiasis, or gnat fever.

The genus Anopheles was chiefly looked for, because these had been shown to be concerned in the transference of the parasite. In the barracks at Wilberforce, Sierra Leone, 25 per cent. of the soldiers suffered from all three forms of malaria or gnat fever. All the gnats caught in the barracks were *Anopheles costalis* except one, and out of 109 of those examined, parasites were found in 27.

Some experiments on feeding Anopheles on a patient with *H. malariae* gave positive results, several young zygotes being found in the gnat. These gnats were caught in a building where there were no fever patients, and numbers of them had been examined and found free from parasites. When, however, Anopheles bred from the larvæ and kept in test tubes were applied to the skin of a patient, they were found not to feed copiously, and negative results, as regards zygotes, were obtained on dissecting them. It is suggested that the explanation of the failure was the non-fertilisation of the females ; it seems that the female gnat requires blood for the nutrition of the eggs. If the ova are not fertilised, the blood is possibly evacuated without some digestive process being performed which may be necessary to the vitality of the zygotes.

Measures of precaution against the bites of gnats, and measures for reducing their numbers, are discussed in the chapter on prevention. It is remarked that neither Europeans nor natives made any effort to keep down the numbers of gnats, which constitute a very serious pest in Sierra Leone, as they do in all tropical towns. Both this report and the "Instructions for the Prevention of Malaria" should be invaluable to residents abroad, as indicating how they may protect themselves from the annoyance from gnats, and from the evil results that may arise from their "bites."

Experiments were instituted with a view to destroying the adults or larvæ, and to prevent the insects from breeding. It was not always possible to discover the breeding pools of the Anopheles infecting a particular spot ; for instance, none could be found at Wilberforce, the nearest pools where larvæ were found being nearly a mile away. Dr. Fielding Ould tried experiments with tar, and found the film on the surface of the pool lasted longer than a film of kerosene oil ; while both killed the larvæ and prevented them from hatching so long as the film lasted.

In the addenda are some good micro-photographs of both zygotes and blasts from the gnat.

JOSEPH BERTRAND.

AMONG the heavy losses which science has suffered during the past few months, few will be the subject of such universal regret as the death, on April 3, of M. Joseph Bertrand. The loss will be felt, not only by mathematicians, but also by the great body of scientific men with whom Bertrand was brought into contact in his capacity of life-secretary of the Paris Academy of Sciences.

Joseph Bertrand was born at Paris in 1823, and at an early age commenced his mathematical studies under the guidance of his father, who had been a pupil of the Ecole Polytechnique. Subsequently Bertrand entered the Collège de St. Louis, and at the age of eleven he succeeded in passing the examination for entrance into the École Polytechnique, although it was not till six years later that he actually entered the college, when he headed the list of candidates. As a boy, Bertrand would nowadays be styled an "infant prodigy," by analogy with the youthful musicians who created such a *furore* at London concerts a few years ago ; and it is interesting to learn from M. Maurice Lévy that this title (*enfant prodige*) was actually bestowed on him by the scientific men who welcomed Joseph as a young colleague at an early stage of his existence. The analogy between music and mathematics seems, moreover, to have suggested itself to M. Jules Lemaitre, Director of the French Academy, who remarks that such precocity of genius is sometimes found in mathematics and in music, but is never seen in literature. We find Bertrand publishing a paper on the theory of electricity in 1839, when he must have been about sixteen years old, and it is hardly surprising in view of this to learn that his precocity amazed his masters. In 1841 he wrote papers on indeterminate forms, Jacobi's theorem and differential equations, and from that time onward he was fairly launched on his career as a writer of mathematical papers, his output being five papers in 1842 and seven in 1843. But whereas most of the young musical *débutants*, to whom reference has just been made, have enjoyed only ephemeral reputations, and have exhausted their energies in their premature efforts to an extent which must have prejudiced their future careers, Bertrand succeeded in achieving all that was predicted of him ; he showed no diminution of energy in advancing years, and, moreover, to judge from all accounts, he developed into a good man of business, a quality which is commonly regarded by "the general public" as incompatible with being a genius.

In 1842 he had a narrow escape from being killed in a railway accident near Meudon. In company with his brother, Alexandre Bertrand, now distinguished as an archæologist, he had gone to Versailles to see the fountains, and on the return journey the accident occurred in which Admiral Dumont d'Erville was killed. Both of the Bertrand brothers suffered, Joseph losing the bridge of his nose—a misfortune which disfigured him for life—while Alexandre's leg was fractured. Joseph rescued his brother by dragging him through "the skylight," the carriage doors being locked. A few months later he